

PLEASURE TEST SERIES XI - 05

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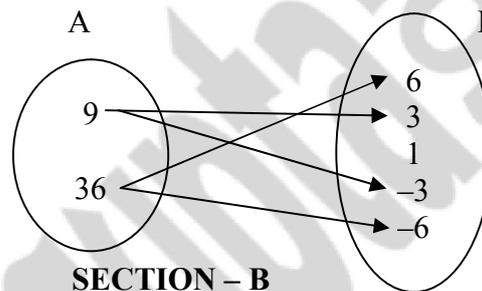
Time Allowed : 180 Minutes

(For 2014 - 15)

Max. Marks : 100

SECTION - A

- Q01.** How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if repetition of the digits is permitted?
- Q02.** Evaluate : $\lim_{x \rightarrow 1} \frac{[x + x^2 + x^3 + \dots + x^n] - n}{x - 1}$.
- Q03.** A wheel makes 500 revolutions per minute. Through how many radians does it turn in one second?
- Q04.** A die is rolled. Let E be the event "die shows 4" and F be the event "die shows even number". Are events E and F mutually exclusive?
- Q05.** Solve : $25x^2 - 30x + 11 = 0$.
- Q06.** Following figure shows a relation between the sets A and B. Write the relation in roster form.



SECTION - B

- Q07.** Prove that $10^{2n-1} + 1$ is divisible by 11 for all $n \in \mathbb{N}$.
- Q08.** What is the number of ways of choosing four cards from a pack of 52 playing cards? In how many of these (i) four cards are of the same suits? (ii) are face cards?
- Q09.** Let the sum of n , $2n$ and $3n$ terms of an AP be S_1 , S_2 and S_3 respectively show that $S_3 = 3(S_2 - S_1)$.
- Q10.** Find a point in XY-plane which is equidistant from the points $(2, 0, 3)$, $(0, 3, 2)$ and $(0, 0, 1)$.
- Q11.** A market research group conducted survey of 1000 consumers and reported that 720 consumers like product X and 450 consumers like product Y. What is the least number of consumers that must have liked both the products?
- Q12.** (a) Evaluate : $\cos 35^\circ + \cos 145^\circ + \cos 330^\circ$.
 (b) Evaluate : $\sin 130^\circ \cos 110^\circ + \cos 130^\circ \sin 110^\circ$.
 (c) Prove that : $\tan 30^\circ + \tan 15^\circ + \tan 30^\circ \tan 15^\circ = 1$.
 (d) What is the value of $\tan \frac{13\pi}{12}$?
- OR** Solve for x : $2 \cos^2 x + 3 \sin x = 0$.

- Q13.** Calculate the variance for the following frequency distribution :

Class	0 - 30	30 - 60	60 - 90	90 - 120	120 - 150	150 - 180	180 - 210
Frequency	2	3	5	10	3	5	2

- Q14.** If the ratio of the coefficients of 3rd and 4th terms in the binomial expansion of $\left(x + \frac{1}{2x}\right)^n$ is 1 : 2 then, find the value of n .

OR The sum of the coefficients of first three terms in the binomial expansion of $\left(x - \frac{3}{x^2}\right)^p$, $x \neq 0$ is 559 then determine the term containing x^3 .

- Q15.** P, Q, R shot to hit a target. If P hits 3 times in 4 trials, Q hits 2 times in 3 trials and R hits 4 times in 5 trials, what is the probability that the target is hit by at least two persons.
- Q16.** (a) Write the equation of the angle bisectors of the angle between the coordinate axes.
 (b) Find the equation of a line perpendicular to $2x - 3y + 7 = 0$ and having x-intercept of 4.
 (c) Slope of a line joining the points $(7, 3)$ and $(k, 2)$ is -4 . Find the value of k .
 (d) Reduce the line $\sqrt{3}x - y + 8 = 0$ in normal form.

- Q17.** An arch is in the form of a parabola with its axis vertical. The arch is 10m high and 5m wide at the base. How wide is it 2m from the vertex of the parabola?
OR What is the area of an equilateral triangle which has been inscribed in the circle having the equation as $x^2 + y^2 + 4x - 4y + 1 = 0$?
- Q18.** Solve the system of inequalities graphically : $x + 2y \geq 10$, $2x + y \geq 8$, $x \geq 0$, $y \geq 0$.
- Q19. (i)** An experiment consists of tossing coin and then throwing it second time if a head occurs. If a tail occurs on the first toss then, a die is rolled once. Write the sample space of this experiment.
(ii) Four cards are drawn from a well shuffled deck of 52 playing cards. What is the probability of attaining three diamonds and one spades? Playing cards are used in gambling. How is the gambling a bad habit? Give your opinion.
OR In a room there are 9 persons out of whom 3 persons like to ride a cycle as it is 'Environment Friendly' as well as mode of exercise. Four persons are promoters of 'Save Tiger' campaign and two persons believe in 'Honesty is the Best Policy'. A person is selected at random from the room. What is the probability of a person chosen to be from the 'Save Tiger' campaign? Give your views about the same.

SECTION – C

- Q20. (i)** Reduce $\sin 60^\circ + i \cos 60^\circ$ in its polar form.
(ii) Write the additive inverse of $\sqrt{5} - 3i$.
(iii) Simplify $\left(\frac{i}{2} + 2\right)^3$ and express in the standard form.
(iv) What is the multiplicative inverse of $\frac{2+3i}{3-2i}$?
(v) What is the conjugate of $\sqrt{-3} + 4i^2$?
(vi) Solve : $3x + (2x - y)i = 6 - 3i$.
OR If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = x + iy$, then find the value of (x, y) . Hence obtain polar form of $x + iy$.
- Q21. (i)** Prove that : $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$.
(ii) Let A and B be sets. If $A \cap X = B \cap X = \{\}$ and $A \cup X = B \cup X$ for some set X, show that $A = B$.
- Q22. (i)** If $A = \{1, 3, 5\}$ and $B = \{2, 3\}$, show that $A \times B \neq B \times A$.
(ii) Let $A = \{1, 2, 3, 4, 5, 6\}$. Let R be the relation on the set A which is defined by $\{(a, b) : a, b \in A, b \text{ is exactly divisible by } a\}$. (a) Write R in roster form, (b) Find the domain of R, (c) Find the range of R (d) Write the co-domain of R.
- Q23.** Evaluate : $.4 + .44 + .444 + \dots$ upto 40 terms.
OR The sum of two numbers is 6 times their geometric mean. Show that the numbers are in the ratio $[3 + 2\sqrt{2}] : [3 - 2\sqrt{2}]$.
- Q24. (i)** Differentiate $\frac{2x^2 - 3}{x}$ with respect to x by first principle method.
(ii) If $y = \sqrt{\frac{x}{a}} + \sqrt{\frac{a}{x}}$ then, show that $2xy \left(\frac{dy}{dx}\right) = \frac{x}{a} - \frac{a}{x}$.
- Q25. (i)** A man wants to cut three lengths from a single piece of board of length 91cm. The second length is to be 3cm longer than the shortest and the third length is to be twice as long as the shortest. What are the possible lengths of the shortest board if the third piece is to be at least 5cm longer than the second?
(ii) Solve : $\frac{x+3}{x-2} > 0$.
- Q26. (i)** Verify by the method of contradiction that $\sqrt{11}$ is an irrational number.
(ii) Write the converse of "If two lines are parallel then they do not intersect in the same plane".
(iii) Write the negation of "Australia is a continent".
(iv) Write the truth value of : Every rectangle is a square and every square is a rectangle.
(v) Rewrite the statement "When you sing, my ears hurt." in the form of conditional statement.
(vi) Write the contra-positive of "If a number is divisible by 9, then it is divisible by 3."

HINTS & ANSWERS for PTS XI – 05 [2014-2015]

- Q01.** 108 **Q02.** $\frac{n(n+1)}{2}$ **Q03.** $\frac{50\pi}{3}$
- Q04.** As $E \cap F = \{4\} \neq \phi$ so, E and F are not mutually exclusive. **Q05.** $\frac{3}{5} \pm i \frac{\sqrt{2}}{5}$
- Q06.** $\{(9, 3), (9, -3), (36, 6), (36, -6)\}$
- Q08.** ${}^{52}C_4 = 270725$, (i) ${}^{13}C_4 + {}^{13}C_4 + {}^{13}C_4 + {}^{13}C_4 = 4 \times {}^{13}C_4 = 2860$ (ii) ${}^{12}C_4 = 495$
- Q10.** (3, 2, 0) **Q11.** 170
- Q12.** (a) $\frac{\sqrt{3}}{2}$ (b) $-\frac{\sqrt{3}}{2}$ (d) $2 - \sqrt{3}$ **OR** $n\pi + (-1)^n \frac{7\pi}{6}, n \in Z$
- Q13.** 2273.76 **Q14.** Value of n is 12 **OR** Obtain p = 12. Then $T_4 = -27 \times {}^{12}C_3 x^3$.
- Q15.** Required probability = $1 - [P(\text{none of them hits}) + P(\text{exactly one of them hits})]$
 $= 1 - \left[\left(\frac{1}{4} \times \frac{1}{3} \times \frac{1}{5} \right) + \left(\frac{3}{4} \times \frac{1}{3} \times \frac{1}{5} + \frac{1}{4} \times \frac{2}{3} \times \frac{1}{5} + \frac{1}{4} \times \frac{1}{3} \times \frac{4}{5} \right) \right] = \frac{5}{6}$.
- Q16.** (a) $y = \pm x$ (b) $3x + 2y = 12$ (c) $\frac{29}{4}$ (d) $x \cos \frac{5\pi}{6} + y \sin \frac{5\pi}{6} = 4$
- Q17.** $\sqrt{5} \text{ m}$ **OR** $\frac{21\sqrt{3}}{4} \text{ Sq. units}$
- Q19.** (i) {HH, HT, T1, T2, ..., T6} (ii) $\frac{{}^{13}C_3 \times {}^{13}C_1}{{}^{52}C_4}$ **OR** $\frac{4}{9}$
- Q20.** (i) $1(\cos 30^\circ + i \sin 30^\circ)$ (ii) $-\sqrt{5} + 3i$ (iii) $\frac{52}{8} + i \frac{47}{8}$
 (iv) $0 - i$ (v) $-4 - i\sqrt{3}$ (vi) $x = 2, y = 7$
OR $x = 0, y = -2$; Polar form : $2 \left(\cos \left(-\frac{\pi}{2} \right) + i \sin \left(-\frac{\pi}{2} \right) \right)$
- Q21.** (i) See OP Gupta's MATHEMATICIA Chapter 01 Q35 (b)
 (ii) See OP Gupta's MATHEMATICIA Chapter 01 Example 07
- Q22.** (ii) See OP Gupta's MATHEMATICIA Chapter 02 Q13
- Q23.** Obtain $S_n = \frac{4}{9} \left[n - \frac{1}{9} (1 - 0.1^n) \right]$. Then put $n = 40$, $S_{40} = \frac{4}{9} \left[40 - \frac{1}{9} (1 - 0.1^{40}) \right]$.
- Q24.** (i) $2 + \frac{3}{x^2}$
- Q25.** (i) See OP Gupta's MATHEMATICIA Chapter 06 Q41
 (ii) See OP Gupta's MATHEMATICIA Chapter 06 Q50
- Q26.** (i) Let us assume that $\sqrt{11}$ is rational number.
 As $\sqrt{11}$ is rational, so there exists two coprime integers a and b where $b \neq 0$ such that
- $$\sqrt{11} = \frac{a}{b} \quad \Rightarrow a = \sqrt{11} b$$
- Squaring on both the sides, we get : $a^2 = 11 b^2$... (i)
 Therefore, 11 divides a^2 and hence 11 divides a as well.
 So, we can write : $a = 11 c$.
 Substituting the value of a in (i), we get : $(11c)^2 = 11 b^2 \Rightarrow b^2 = 11c^2$.
 This means that 11 divides b^2 and hence 11 divides b as well.
 Therefore, a and b have at least 11 as a common factor i.e. they are not coprimes.
 This leads to the contradiction which has arisen due to our incorrect assumption that $\sqrt{11}$ is rational.
 Hence $\sqrt{11}$ is irrational number. (ii) If two lines do not in the same plane then the lines are parallel.
 (iii) It is not true that Australia is a continent. (iv) F
 (v) If you sing then my ears hurt. (vi) If a number is not divisible by 3 then it is not divisible by 9.